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Short communication

Effects of sulphuric acid, mechanical scarification and wet heat treatments on germination of seeds of African locust bean tree, *Parkia biglobosa*

B. L. Aliero

Department of Biological Sciences, Usmanu Dafodiyo University, Sokoto, Nigeria. E-mail: blaliero@yahoo.co.uk.

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Effects of different treatment methods on the germination of seeds of *Parkia biglobosa* (mimosaceae) were carried out. Prior treatment of seeds with sulphuric acid, wet heat and mechanical scarification were found to induce germination of the dormant seeds. These methods could be applied to raise seedlings of the plant for field propagation.

Key words: Scarification, germination, seeds, *Parkia biglobosa*.

INTRODUCTION

Parkia biglobosa (Jacq. Benth) is popularly known as the African locust bean (Osundina, 1995). It belongs to the family leguminosae-mimosoideae (MIM). It often grows to a height of 20 m. The fruit is a legume, slightly indented between the seeds at maturity. The seeds are embedded in a yellowish, mealy, sweet testing edible pulp (Hatchinson and Dalziel, 1954; Aliero et al., 2001).

This widespread savannah tree is also distributed in some parts of the tropical rainforest. The bark of the tree is thought to have some medicinal properties. It is widely utilized, especially in the villages for curing toothache (Usher, 1954), and treating stomach upset and diarrhoea (Lewis and Lewis, 1977). The seeds are used extensively as flavouring and nutritious additives to soups and stews. They contain about 54% fat and 30 % protein of high quality in addition to vitamins and minerals (Anthonio and Isoun, 1983).

Parkia is also used in agroforestry because of its ability to fix atmospheric nitrogen in soil and the seeds are reported to retain viability for long time (Leopold and Kreidemann, 1975). However, seedlings of this important plant are rarely seen growing in the wild. The existing trees are ageing and fast disappearing. It is therefore imperative to intervene to save this important tree from extinction, hence the studies on seed germination as a preliminary step in its conservation.

MATRIALS AND METHODS

Seeds of *Parkia biglobosa* were purchased from the central market in Sokoto, sun dried and their viability tested in accordance with methods of Copeland (1976) and Germ (1975). The seed stock was then kept in paper envelopes and stored in metal cabinets in the University Herbarium. From the stock, samples of seeds were taken and subjected to germination inducing treatments as outlined below. Fourteen seeds were taken and immersed in concentrated grade H_2SO_4 in a conical flask for 1 min. The acid was then decanted and the seeds removed and properly washed with distilled water. Seven seeds each were placed immediately on filter paper soaked in distilled water and laden on 20 cm petridish making two replicates. Similar procedure was repeated with the same acid concentration at 3 and 5 min, respectively. The above procedure was also repeated for 90%, 70% and 50% concentration of sulphuric acid. Similar numbers of seeds were soaked in distilled for the same period as control.

For mechanical scarification of seeds, dried seeds were taken and placed in metal container with gravels. The container was vigorously shaken so that the gravels scratch the seed epicarp. The seeds were then taken out of the gravel, dusted and then placed in petridishes with moisture laden filter papers. Seven seeds each were placed each in a set of two petridishes. Distilled water was added at 24 h intervals and germination of the seeds observed. Fourteen seeds that were not scratched were used as control. Effect of wet heat was tested by placing fourteen seeds on folded wire gauze with handle; the seeds were then dipped in boiling water and removed at time intervals of 1, 2, 3, 4 and 5 s, respectively. The seeds were then allowed to cool by soaking in tap water. For

each time interval two petridishes were prepared each containing seven seeds on moisture laden filter paper. Fourteen seeds for the control were not dipped in hot water.

Effect of wetting and drying of seeds was tested by placing fourteen seeds in a beaker containing tap water for 24 h. The seeds were removed and placed on a white paper and sun dried. The cycle of wetting and drying was repeated 5 times. Thereafter 7 seeds each were placed in two set of petridishes on soaked filter papers. Similar numbers of untreated seeds were used as control. The experiments along with other treatments were observed for eight weeks.

RESULTS AND DISCUSSION

Treatment with H_2SO_4 was effective in breaking the seed dormancy and the result is shown in Table 1. Seeds soaked in concentrated acid for 3 min gave the highest germination of 50%. The treatment with 90% concentration of the acid for 3 min gave 28.6% germination, but none of the seeds germinated after soaking for 5 min. No germination was recorded from seeds in the control for the period of the experiment.

Total germination of seeds mechanically scratched in gravel was 21.4% and no germination from the control. Treatment of seeds for 4 sec in hot water gave the highest germination of 42.9% (Table 2).

Dormancy in seeds is usually associated with the factors of the protective covering, the seeds coat or the enclosed embryo. From the investigations carried out, such treatment as wet heat and subsequent soaking in water, mechanical scarification, and application of sulphuric acid were found to induce germination of seeds of *Parkia*. From the above one can infer that dormancy of the seeds of *parkia* was probably associated with the seeds coat, since the treatment that induce germination were those that can effect disruption of the seed coat. According to Levitt (1974), immersion of seed in highest concentrated sulphuric acid disrupts the seed coat. The fact that 98% concentrated sulphuric acid gave the highest percentage of germination and within the shortest period as compared 90%, 70% and 50% respectively, indicate that the more rapidly the seed coat is ruptured the faster the rate of germination, however, prolonged Emerson may be injurious to the seeds as the acid may rapture vital parts of the embryo. Sulphuric acid is thought to disrupt the seed coat and expose the lumens of the macrosclereids cells, permitting imbibition of water (Nikoleave, 1977) which triggers germination. In the untreated seeds water may not be available to the embryo.

Sudden dip of dry seeds in boiling water may lead to the rapture of the coat wall allowing water to permeate the seed tissues causing physiological changes and subsequent germination of the embryo (Agboola and Etejere, 1991; Agboola and Adedire, 1998; Sabongari, 2001). Plants that pass through their rest period at low temperature may have their rest broken by warm water baths (Leopold and Kreidman, 1975). Germination decreases when seeds were allowed in water for more than 4 secs, suggesting that embryo may get destroyed on contact with boiling water for a prolonged period.

Seed dormancy resulting from an impermeable seed coat may be overcome by peeling off the coat (Nikoleave, 1977). Germination of seeds whose coat were mechanically scarified is therefore not surprising. Where seed coat is softened, the process of hydrolysis could commence to release simple sugars that could be readily utilized in protein synthesis. Release of hormones such as auxins and ethylene which could increase nucleic acid metabolism and protein synthesis (Irwin, 1982 and Jackson, 1994).

Table 1. *P. biglobosa* seeds* treated with H_2SO_4 and their response to germination.

Concentration	Treatment (min)	Mean germination (%)
Absolute	1	14.3±0.18
	3	50.0±0.65
	5	35.7±0.47
90%	1	23.7±0.47
	3	28.6±0.37
	5	0
70%	1	0
	3	7.1±0.14
	5	7.1±0.14
50%	1	7.1±0.14
	3	0
	5	0
Control	0	0

*Number of seeds sown per each treatment is 14.

Table 2. Effect of wet heat and cooling of seeds in tap water on germination of *P. biglobosa*.

Heating duration (s)	Mean germination (%)
1	7.1 ±0.14
2	28.6±0.37
3	21.4±0.29
4	42.9±0.55
5	28.6±0.37
Control	0

*Number of seeds sown per each treatment is 14.

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